

LISTING OF THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claim 1 (Currently Amended)

A controller device comprising:

a body portion providing a support for the controller device and having a mounting portion;

four and only four transversely flexible but axially stiff arms extending from the mounting portion of the body portion, the arms being spaced from one another in three dimensions in a substantially tetrahedral array, each arm having an axis and a tip portion;

a gripping device;

four connection joints, each connection joint engaging one of the tip portions therein connecting a respective one of the arms to the gripping device, each connecting joint having a cylindrical socket with an axis substantially aligned with the axis of the arm and having a substantially part-spherical engagement element engaged in and relatively slidably along the socket and rotatable in the socket to restrict relative motion of the four arms within the controller device, whereby a sum of joints' constraints amounting to at least six; a gripping device attached to the connection joints, the gripping device being is operable to receive and transmit any applied force and any applied torque in any of the three dimensions, and the interaction between the gripping device, the connection joints and the arms results in any applied force and any applied torque resolving into four opposing forces which lie in faces of the tetrahedral array and are substantially normal to the axes of the four arms, and substantially no axial load is applied to the arms; and

a response detector operable for monitoring responses to the applied force and applied torque in at least three of the four arms whereby transverse displacement of the arms is monitored, the response detector being further operable to provide an output signal representative of the any force and any torque applied through the gripping device.

Claim 2 (Previously Presented)

A controller device as defined in claim 1, wherein the response detector is operable for

directly monitoring response in only three of the four arms, and the controller device further comprises a calculator operable for calculating values of a response in the fourth arm from data representing monitored responses in the only three arms.

Claim 3 (Previously Presented)

A controller device as defined in claim 1, further comprising a system connected to the response detector to receive the output signal.

Claim 4 (Currently Amended)

A controller device as defined in claim 1, wherein the arms are arranged in a tetrahedron shaped envelope and are almost equally mutually spaced in a symmetrical sense with a small degree of non-symmetry to provide pre-loading at the connection means joints.

Claim 5 (Canceled)

Claim 6 (Currently Amended)

A controller device as defined in claim 1, wherein the tip portion of each arm has a portion ~~with a providing the substantially part-spherical profile and engagement element of each connection joint includes a cylindrical bore having an axis, each tip portion being slidably along the cylindrical bore of one of the connection joint and each arm being rotatable relative to the axis of the bore.~~

Claim 7 (Previously Presented)

A controller device as defined in claim 1, wherein the response detector includes a plurality of optical sensors each of which has an emitter and a detector, the optical sensors being arranged substantially in a same plane and each optical sensor having a respective optical axis transverse to an axis of the associated arm.

Claim 8 (Previously Presented)

A controller device as defined in claim 7, further comprising a total of six optical sensors disposed in pairs around three of the four arms.

Claim 9 (Previously Presented)

A controller device as defined in claim 1, and including a total of eight sensors provided in an array so that displacements in an X-Y set of responses for each of the four arms results in eight readings constituting the output signal.

Claim 10 (Currently Amended)

A computer system comprising:

a controller device including:

a body providing a support for the controller device and having a mounting portion;
four and only four transversely flexible but axially stiff arms extending from the
mounting portion of the body portion, the arms being spaced from one another in three
dimensions in a substantially tetrahedral array, each arm having an axis and a tip portion;
a gripping device;
four connection joints, each connection joint engaging one of the tip portions therein
connecting a respective one of the arms to the gripping device, each connecting joint having a
cylindrical socket with an axis substantially aligned with the axis of the arm and having a
substantially part-spherical engagement element engaged in and relatively slidably along the
socket and rotatable in the socket to restrict relative motion of the four arms within the controller
device, whereby such that a sum of joints' constraints amounts to at least six, a gripping device
attached to the connection joints, the gripping device being is operable to receive and transmit
any applied force and any applied torque in any of the three dimensions, and the interaction
between the gripping device, the connection joints and the arms results in any applied force and
any applied torque resolving into four opposing forces which lie in faces of the tetrahedral array
and are substantially normal to the axes of the four arms, and substantially no axial load is
applied to the arms; and

a response detector operable for monitoring responses to the applied force and applied
torque transmitted by the gripping device in at least three of the four arms whereby transverse
displacement of the arms is monitored, the responses providing detector being further
operable to provide an output signal representative of the applied any force and the applied any
torque applied to the gripping means, the output signal being operable to control the computer
systemthrough the gripping device.

Claim 11 (Previously Presented)

A computer system as defined in claim 10, wherein the response detector is operable to directly monitor response in only selected three of the four arms, and the controller device further comprises a calculator operable for calculating values of a response in the fourth arm from data representing the monitored responses in the selected three arms.

Claim 12 (Previously Presented)

A computer system as defined in claim 10, wherein the arms are arranged in a tetrahedron shaped envelope and are almost equally mutually symmetrically spaced with a small degree of non-symmetry to provide pre-loading at the connection joints.

Claims 13-14 (Canceled)

Claim 15 (Previously Presented)

A computer system as defined in claim 10, wherein each of the response detectors includes a plurality of optical sensors which are concentric and disposed on a same plane.

Claim 16 (Previously Presented)

A computer system as defined in claim 15, further comprising a total of six optical sensors disposed in pairs around three of the four arms.

Claims 17-18 (Canceled)